

REMARKS

The application has been reviewed in light of the Office Action mailed on December 22, 2009. Claims 1-7 and 16 are currently pending in the application, with claim 1 being in independent form. It is respectfully submitted that the claims pending in the application, namely claims 1-7 and 16 are patentable over the prior art. Reconsideration is respectfully requested.

The present invention is directed to a conductive line structure for a field effect transistor (FET) based magnetic random access memory (MRAM) device. The device includes a lower metallization line in a dielectric layer. A lateral metal strap is conductively coupled to the lower metallization line. A magnetic tunnel junction (MTJ) stack is formed on the metal strap. A metal hardmask layer is formed on the MTJ stack. A metal shield is formed over the metal hardmask layer. The metal shield is self-aligned with respect to the metal strap. The metal shield and the lateral metal strap are substantially coextensive. An upper metallization line is conductively coupled to the metal shield. The metal shield serves as an etch stop during the formation of the upper metallization line. The MTJ stack is not coextensive with the metal strap or the metal shield.

Rejection of Claims 1-3, 6-7 and 16 under 35 U.S.C. § 103(a)

Claims 1-3, 6-7 and 16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwata et al. (U.S. Patent No. 6,795,334), hereinafter "Iwata" in view of Tsang (U.S. Patent No. 6,909,630), hereinafter "Tsang".

With respect to claim 1, Iwata fails to disclose or suggest the recited "a metal hardmask layer formed atop said MTJ stack", "a metal shield formed over said metal hardmask

layer, said metal shield being substantially coextensive with said metal strap” and “an upper metallization line conductively coupled to said metal shield, wherein said metal shield serves as an etch stop during the formation of said upper metallization line”. Iwata discloses a magnetic random access memory. Iwata teaches forming a metal layer 71 on a barrier metal layer 70 (column 60, lines 51-55, FIG. 101). A metal layer 72 is formed on a dielectric interlayer 69. Metal layer 72 serves as the lower electrodes of first MTJ elements 73 (column 60, lines 58-64, FIG. 101). A metal layer 74 is formed on a dielectric layer 75A. Metal layer 74 serves as the upper electrodes of first MTJ elements 73 (column 61, lines 5-7, FIG. 101). A barrier metal layer 80 is formed on metal layer 74 (column 62, lines 1-2, FIG. 101). A metal layer 81 is formed on barrier metal layer 80 (column 62, lines 3-5, FIG. 101). Iwata does not teach forming a metal hardmask layer atop first MTJ elements 73. Iwata only teaches forming metal layer 74 as the upper electrodes of first MTJ elements 73. Iwata does not teach forming a metal shield over a metal hardmask layer. Metal layer 81 is not conductively coupled to a metal shield. Metal layer 74 does not serve as an etch stop during the formation of metal layer 81.

With respect to claim 1, Tsang fails to disclose or suggest the recited “said metal shield being substantially coextensive with said metal strap” and “an upper metallization line conductively coupled to said metal shield, wherein said metal shield serves as an etch stop during the formation of said upper metallization line”. Referring to Fig. 7, magnetic bit line 32' is not substantially coextensive with conductive layer 79. Magnetic bit line 32' extends well beyond conductive layer 79. Additionally, conductive layer 79 extends well beyond capping layer 3104. Conductive layer 79 is not substantially coextensive with capping layer 3104. Tsang does not disclose or suggest using a metal shield as an etch stop to form the magnetic memory.

Neither Iwata nor Tsang alone or in combination teach or suggest “a metal shield formed over said metal hardmask layer, said metal shield being substantially coextensive with said metal strap” and “an upper metallization line conductively coupled to said metal shield, wherein said metal shield serves as an etch stop during the formation of said upper metallization line”. Additionally, there is no suggestion in Iwata or Tsang that they be combined in the manner proposed by the Examiner. Accordingly, claim 1 is believed to be patentable over Iwata in view of Tsang. Therefore, reconsideration and withdrawal of the rejection with respect to this claim is respectfully requested and allowance of this claim is earnestly solicited.

Claims 2-3, 6-7 and 16 depend directly or indirectly from independent claim 1 and are therefore patentable for at least the reasons given hereinabove.

Applicants respectfully request that the rejection of these claims be withdrawn and allowance of these claims is earnestly solicited.

Rejection of Claims 4-5 under 35 U.S.C. § 103(a)

Claims 4-5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwata in view of Tsang as applied to claim 1 in view of Kim (U.S. Patent No. 6,806,096), hereinafter “Kim”.

Claims 4-5 depend directly from claim 1. Since claim 1 is believed to be allowable, then claims 4-5 are believed to be allowable as well for at least the reasons given hereinabove.

Applicant respectfully request that the rejection of these claims be withdrawn and allowance of these claims is earnestly solicited.

In view of the foregoing remarks, Applicant respectfully submits that all claims now pending in this application, namely Claims 1-7 and 16 are now in condition for allowance. Accordingly, early and favorable consideration of this application is respectfully requested. Should the Examiner believe that a telephone or personal interview may facilitate resolution of any remaining matters, he is respectfully requested to contact Applicant's undersigned attorney at the telephone number indicated below.

No fee is believed to be due for the submission of this paper. If any fees are required, however, the Commissioner is authorized to charge such fees to Deposit Account No. 09-0458.

Respectfully Submitted,

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